APPENDIX I

# M2A3 BRADLEY FIGHTING VEHICLE CONSIDERATIONS

*The mechanized infantry platoon equipped with the M2A3 Bradley fighting vehicle (BFV) has increased capabilities to employ infantry squads and direct- and indirect-fire weapons systems. The mechanized infantry platoon can conduct operations ranging from sustained high-intensity operations to stability operations. Its enhanced lethality, protection, and decision-making tools result from technological improvements in command, control, communications, and computers (C4) and its overall effect on available information. The M2A3 increases the platoon's and squad's abilities to detect, identify, and acquire enemy targets. It also improves direct- and indirect-fire control. The M2A3's command and control (C2) capabilities improve the planning process, which leads to improved situational understanding (SU).*

## I-1. GENERAL CONSIDERATIONS

The M2A3 BFV enhances the platoon's capabilities to conduct operations with greater *lethality, survivability, C4, sustainability*, and *mobility*. The M2A3 BFV has more equipment than earlier models. This equipment is also more complex than that on earlier models, which requires more cross training to ensure soldiers can fill vacancies or shortfalls in critical positions. Also, because the M2A3 BFV platoon can transfer more information at every level, leaders and soldiers must work together to manage the information.

a. **Lethality**. The M2A3 BFV features an improved Bradley acquisition system (IBAS), which adds an improved target acquisition subsystem and missile control subsystem. The improvements also include a second-generation, forward-looking infrared radar (FLIR); a thermal sight; a target-designation function; dual-target tracking; an eye-safe laser range finder; an automatic gun-target adjustment; automatic optical alignment; and "hunter-killer" capability. Second-generation FLIR allows the Bradley commander or gunner to identify and acquire targets beyond the range of the vehicle's weapon systems. The IBAS enables the user to acquire, recognize, identify, and automatically track two targets within the same field of view (FOV) and selected magnification, day or night. While moving (or stationary), the M2A3 BFV can use the 25-mm or 7.62-mm to engage either of two targets appearing in the same FOV, from any aspect. While stationary, the M2A3 BFV can use the TOW to engage either of two targets appearing in the same FOV, from any aspect.

b. **Survivability**. Equipment on the M2A3 that helps ensure survivability includes:

- Roof fragmentation protection.
- Mounting capability for reactive armor tiles.
- Aluminum structure with steel applique, spaced laminate steel armor, or both.
- Titanium roof armor.
- Ten-soldier gas particulate filter unit.
- Halon fixed fire extinguisher systems in engine and personnel compartments.
- Portable CO2 fire extinguishers.

c. **Command, Control, Communications and Computers**. Advances in C4 include C2 software, navigational software, digital communications capability, commander's independent viewer (CIV), and squad leader's display (SLD). Leaders of the platoon "see" a common battlefield and can see the locations of other platoon elements and known enemy positions relative to their own position. They also have access to the mission's operational graphics and Force XXI battle command brigade and below (FBCB2) (Table I-1).

| EQUIPMENT | CAPABILITIES |
|---|---|
| PRC-119/OE-254 radio/antenna | Range 8 km* |
| Command control software: | C2S/VRC-92E – 16 km* |
| | C2S/VRC-92E/OE-254 – 35 km* |
| | C2S/PRC-119 – 4 km* |
| Mini eye-safe laser infrared observation set (MELIOS) | 50 to 9,995 meters; provides distance to target from observer; with a compass or vertical angle measurement (C/VAM) provides azimuth to target from observer |
| * Digital transmission | |

**Table I-1. Digital communications planning data.**

d. **Sustainability.** The M2A3 BFV contains state-of-the-art diagnostic, self-test, and digital logistics reporting via the digital electronics architecture database. The M2A3 BFV sustainment and diagnostic system manages several built-in tests that continually monitor the vehicle and its component functions. These extensive self-tests reduce (but do not omit) the need for manual checks.

e. **Mobility.** The driver's vision enhancer (thermal) and the navigation display unit work together to improve the driver's visibility, therefore improving his ability to drive. This M2A3 BFV has relatively unrestricted mobility in total darkness, in any weather conditions, and in degraded visibility conditions. The M2A3 BFV precision navigation system (PNS) consists of a precision lightweight GPS receiver (PLGR), an inertial navigation unit (INU), a precision lightweight GPS, and a vehicle motion sensor (VMS). These components can operate in five modes: integrated GPS/INU/VMS; GPS only (INU sensor failure); INU/VMS (the GPS receiver fails to acquire satellite signal or shows signs of damage); GPS/INU (VMS failure); and INU only (if the unit has neither a GPS receiver nor a VMS).

(1) ***Precision Lightweight GPS Receiver.*** Normally, the PLGR gives the user precise position coordinates and time and navigational information. If obstructions exist between the satellite and the antenna, the user can enter map coordinates as a way point. When the user picks a way point as a destination, the receiver can provide steering directions, azimuth, and range information to the destination. The PLGR can also show the offset distance from this course line. The PLGR cannot be removed from the BFV and operated in the handheld mode.

(2) ***Inertial Navigation Unit.*** The INU serves as the main navigational system. The INU works from a gyro-based ring laser. The PLGR supplies the INU with initial position data, and the INU, in turn, supplies the turret processor unit (TPU) with the

BFV's position, velocity, attitude, and angular rate and acceleration (roll, pitch, and azimuth).

## I-2. FORCE XXI BATTLE COMMAND BRIGADE AND BELOW

The FBCB2 system comprises a network of computers, global positioning equipment, and communication systems that provide on-the-move, real-time C2 information to tactical combat arms, CS, and CSS soldiers and leaders. FBCB2 serves units performing missions at the tactical level (battalion individual fighting platform).

a. **Information.** The FBCB2 provides a common database with automated friendly positional information. It also provides current tactical battlefield geometry for friendly forces as well as for known or suspected enemy forces. Collectively, the FBCB2 systems generate the friendly operating picture. It displays relevant information, showing the user's location, the location of other friendly forces, observed or templated enemy locations, and all known obstacles. It also provides preformatted, standardized reports, allowing leaders to disseminate graphic overlays and written OPORDs and FRAGOs rapidly. The war-fighter receives data "pushed" from all other battlefield systems to maintain real-time battle information. These battlefield systems draw upon the reports and positional data passed on from the lower tactical internet (TI) to provide information at higher command levels. They push information such as location of adjacent units, known and templated enemy positions, graphics, and OPORDs down to the FBCB2 users.

(1) ***Friendly Information.*** The FBCB2 screen displays an icon for each friendly vehicle in the company, which provides the BC with a clear picture of the BFV's location relative to the platoon. It also gives the platoon leader a picture of his location relative to the company.

(a) Though the system works automatically on vehicles equipped to operate on the TI, it does not provide locations to every friendly element on the battlefield. For example, the system will not automatically track a dismounted rifle squad operating at extended ranges from an M2A3. Also, it does not cover any nondigitally-equipped units or allied or coalition forces operating next to the platoon.

(b) Icons can be imported into FBCB2 for those elements, based on information received from FM radio reports, but the system will not update the icons in real time. Therefore, the leader cannot rely solely on FBCB2 to clear fires. No system can replace a leader's judgment in preventing fratricide.

(2) ***Enemy Information.*** FBCB2 displays enemy information from both top-down and bottom-up feeds. The battalion S2 inputs enemy icons into the system based on spot reports (SPOTREPs) generated by the battalion task force (TF) scouts. Based on his analysis, the S2 augments these actual locations with templated positions in the form of a situational template (SITTEMP).

(a) As the platoon conducts operations, it adds to the enemy information by sending SPOTREPs of enemy activity and obstacles on FBCB2. When a BC sends a SPOTREP, he automatically creates an icon representing the enemy on other FBCB2 systems in the platoon. The platoon leader evaluates the validity of the report. Either he or the platoon sergeant forwards it to company, where either the commander or executive officer evaluates it for accuracy, then forwards it to the company's other platoons and to battalion.

(b) To keep the enemy information current, units must update SPOTREPs concerning enemy locations represented by icons on the FBCB2. Elements send updates whenever the enemy situation changes—that is, when they destroy the enemy element or when the enemy element moves. As the information associated with an icon "ages," the icon fades, eventually disappearing from the FBCB2 screen. Unit SOP should govern the icon "fade" rate.

b. **Architecture.** Each BFV in the platoon has the three basic components of the FBCB2 system (Figure I-1), which communicate with systems at higher levels. Members of the platoon must remember that the FBCB2 can only produce a result (information) as accurate as what goes into it (data from reports received). It may never give a complete or accurate picture of the enemy. The platoon leader, platoon sergeant, section leaders, and squad leaders must ensure that their plans allow for detecting enemy forces not yet reported by digital means.

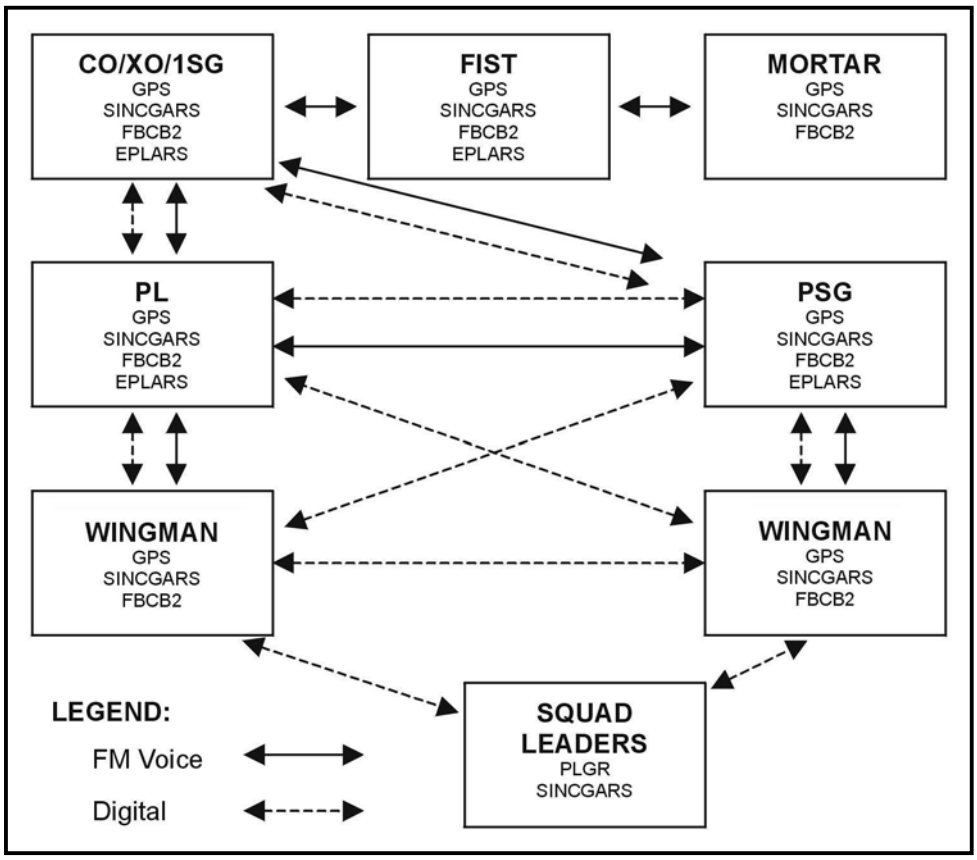


**Figure I-1. FBCB2 architecture.**

(1) ***Global Positioning System.*** The GPS provides the precise location, date, and time for reporting real-time friendly locations and for generating laser-designated map spots for reports.

(2) ***Single-Channel Ground and Airborne Radio Subsystem.*** The single-channel ground and airborne radio subsystem (SINCGARS) provides a secure means of transmitting (both voice and digital) between vehicles in the platoon.

(3) ***Enhanced Position Location and Reporting System.*** The platoon leader's and platoon sergeant's BFVs also have the enhanced position location and reporting system (EPLRS). This system provides a secure digital connection and serves as a router, efficiently sending message traffic internally within the platoon and out to the company and fire support nets. This routing capability ensures that information passes onward even if physical separation on the battlefield, casualties, or mechanical failures disrupt the chain of command.

(4) ***Tactical Internet.*** The TI consists of two parts: the lower TI and the upper TI.

(a) *Lower Tactical Internet*. The FBCB2 terminal provides the monitor, keyboard, mouse, and computing functions that allow the crew to access the system. These systems form the lower TI.

(b) *Upper Tactical Internet*. The upper TI consists of a variety of tactical computer systems and communications equipment located mostly at the battalion level and higher. The most important of these are the maneuver control system (MCS), the all-source analysis system (ASAS), the advanced field artillery tactical data system (AFATDS), and the combat service support control system (CSSCS).

c. **FM Radio.** A requirement remains for FM voice message traffic. Platoon leaders use FM to send contact reports to start battle drills, to cue the BCs to check their FBCB2 screens for new information, and to clarify by describing enemy locations, routes, or obstacles verbally. In urban terrain, the FBCB2 cannot display the terrain in sufficient detail to help leaders in making effective decisions, but leaders can use FM radio transmissions to discuss them.

d. **Combat Orders and Graphics.** FBCB2 can increase the speed and precision of the planning process at the platoon level. It lets leaders add or change operational graphics during the planning process or during execution. This ensures that every element has the most current information to control movement and fires. Platoon leaders can use FBCB2 to transmit OPORDs, FRAGOs, and situational updates as free-text messages over extended distances. Unlike FM voice communications, FBCB2 causes no lost time or data. Like the standardized reports, orders and graphics can be stored for retrieval and reference.

e. **Standardized Reporting.** FBCB2 streamlines the reporting process by enabling the platoon to send and receive preformatted, standardized reports (Figure I-2, page I-6). Standardized reports afford several tactical advantages.

- They help to ensure all required information in a particular report or request is included.
- They reduce the chance of errors in transmission.
- They allow the user to store, retrieve, and refer back to messages.

| FREE TEXT MESSAGE | REDCON ALERT |
|---|---|
| Check Fire | Situation Report (SITREP) |
| Call for Fire | Field Orders [2] |
| Observer Mission Updates[1] | Operations Plan |
| On-Call Fire Command | Fragmentary Order (FRAGO) |
| Message to Observer[1] | Warning Order (WARNO) |
| Fire SPT COORD Measures | Minefield Laying |
| End of Mission/Surveillance | Overlay |
| Sequent Adjust | MOPP Alert |
| Observer Readiness Report | MEDEVAC Report |
| Airborne Fire Mission | Logistics Report |
| Spot Report | Personnel Report |
| Engagement Report | Supply Point Status |
| Contact Report | Task Management |
| Land Route Report | LOG Task Order |
| Obstacle Report | LOG Call for Support |
| Bridge Report | LOG Task Status |
| Position Report | LOG Task Sync |
| NBC 1 Report | Execution Matrix |
| NBC 4 Report [1] | |

[1] Commander's graphic intent (CGI)

[2] Receive Only

**Figure I-2. Preformatted, standardized reports.**

## I-3. ADDITIONAL RESPONSIBILITIES

Personnel in platoons equipped with the M2A3 have the same responsibilities and duties (highlighted in Chapter 1) as their "analog" counterparts; however, they incur additional responsibilities.

a. **Platoon Leader.** The platoon leader of an M2A3-equipped platoon still bears the responsibility for all that the platoon does or fails to do. His additional list of responsibilities and duties are as follows:

- Monitor his CTD for friendly position updates, overlay updates, and digital reports.

- Monitor his CTD so he always knows the positions of the platoon's BFVs relative to the platoon formation, the dismounted rifle squads (if he remains mounted).
- Ensure the platoon's Bradley commanders use the PNS to enhance navigation.

b. **Platoon Sergeant.** The platoon sergeant in the M2A3-equipped platoon remains the senior NCO in the platoon. His tactical expertise in platoon operations includes maneuver of the platoon and employment of all weapons. The platoon sergeant must also—

- Control digital reports (information management) during platoon contact to free the platoon leader to maneuver the rifle squads.
- Ensure soldiers conduct digital precombat inspections during preparation while the platoon leader plans for the upcoming mission.
- Ensure soldiers understand how to use the PNS when navigating the BFVs.
- Monitor his CTD to maintain awareness of squad and section positions relative to the platoon and company formation.

c. **Section Leader.** The section leader in the M2A3-equipped platoon remains mounted and—

- Monitors his CTD for vehicle and section position relative to the platoon formation, digital overlays, and digital reports.
- Navigates correctly, aided by the PNS.
- Sends digital SPOTREPs as requested or when the section makes contact.

d. **Rifle Squad Leader.** The rifle squad leader in the M2A3-equipped platoon bears the responsibility for all the squad does or fails to do. He remains a tactical leader—he leads by example. The rifle squad leader's additional responsibilities include the following:

- Monitor his SLD, while mounted, for friendly position updates, overlay updates, and SITREPs.
- Monitor his SLD so he always knows the BFV's position relative to the platoon formation and the terrain.
- Create digital overlays.
- Create messages (free text or standard format).
- Initialize the system.
- Log on and log off the system.
- Send and receive free-text messages and digital overlays.
- Send or receive messages and overlays to or from another station.

e. **Team Leader.** When no squad leader is present in the M2A3 BFV, the team leader assumes the squad leader's responsibilities.